INFORMATION TECHNOLOGY RESEARCH (ITR)

PROGRAM SOLICITATION

NSF 99-167

DIRECTORATE FOR BIOLOGICAL SCIENCES
DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING
DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIRECTORATE FOR ENGINEERING
DIRECTORATE FOR GEOSCIENCES
DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES
DIRECTORATE FOR SOCIAL, BEHAVIORAL AND ECONOMIC SCIENCES
OFFICE OF POLAR PROGRAMS
DIVISION OF INTERNATIONAL PROGRAMS

DEADLINE DATES:

PROPOSALS WITH BUDGETS OVER $500K
LETTERS OF INTENT (REQUIRED): NOVEMBER 15, 1999
PRE-PROPOSALS: JANUARY 5, 2000
FULL PROPOSALS: APRIL 17, 2000

PROPOSALS WITH BUDGETS NOT EXCEEDING $500K
LETTERS OF INTENT (REQUIRED): JANUARY 5, 2000
FULL PROPOSALS: FEBRUARY 14, 2000

NATIONAL SCIENCE FOUNDATION

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Name: Information Technology Research (ITR)

Short Description/Synopsis of Program:

Over the past decade, the Federal Government has provided crucial investments in information science and engineering, such as the High Performance Computing and Communications (HPCC) Program and the Partnerships for Advanced Computational Infrastructure (PACI). The recent report of the President's Information Technology Advisory Committee (PITAC) noted the important contribution this investment has made, but cautioned that federal support for long-term research on information technology has been "dangerously inadequate." This report has led the Administration to seek additional funding research in information technology. Congressional bill HR 2086 also calls for NSF to make grants for "long-term basic research on networking and information technology, with priority given to research that helps address issues related to high end computing and software and network stability, fragility, reliability, security (including privacy), and scalability."

This solicitation requests proposals for fundamental research in information technology, encouraging in particular research spanning information technology and scientific applications, and in the area of social, ethical and workforce issues. Pending availability of funds, a separate solicitation will be issued for a terascale computer facility for high-end science and engineering.

NSF encourages multi-disciplinary and multi-institutional proposals as well as proposals with international cooperation. NSF has particular responsibility to address educational and community-extending activities. Thus NSF expects that proposals will address and include one or more community-extending concepts such as undergraduate education or links to minority serving institutions, or institutions in EPSCOR states.

Cognizant Program Officers:

William Bainbridge, Social, Behavioral and Economic Sciences (SBE), telephone: 703-306-1741, e-mail: wbainbri@nsf.gov.

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Mark Suskin, Division of International Programs (INT), telephone: 703-306-1702; e-mail: msuskin@nsf.gov .

ELIGIBILITY

- Limitation on the categories of organizations that are eligible to submit proposals:

  Eligible institutions include U. S. universities and colleges and U. S. non-profit research institutions.

  Collaboration with foreign researchers, for-profit corporations, and national laboratories (e.g. Federal agencies and Federally Funded Research and Development Centers (FFRDCs)) is encouraged but those organizations must provide their own funding.

  Proposals are particularly encouraged from minority-serving institutions, undergraduate institutions, and institutions in EPSCOR states, either alone or as members of multi-institutional groups.

  Mutually beneficial international collaborations are encouraged, which may provide access to complementary research facilities, support comparative international studies, or draw on individual abilities and knowledge in all countries. Applicants proposing international collaborations are encouraged to discuss their plans with the contact person for International Programs named in the list of cognizant program officers.

- PI eligibility limitations: **No individual may be Principal Investigator on more than two proposals or a PI or Co-PI on a total of more than four proposals.**
- Limitation on the number of proposals that may be submitted by an organization: None

Applicable Catalog of Federal Domestic Assistance (CFDA) No.: 47.074 (BIO), 47.070 (CISE), 47.076 (EHR), 47.041 (ENG), 47.050 (GEO), 47.049 (MPS), 47.075 (SBE), 47.078 (OPP).

AWARD INFORMATION SUMMARY

- Type of awards anticipated: Standard Grants, Continuing Grants, and Cooperative Agreements.

NSF anticipates that funding for this program will be between $35M and $105M for FY 2000. If funding is near the lower end of this range, NSF anticipates distributing, subject to the availability of funds,

- Approximately 1/6 of program funding in awards at a level of about $2M-3M per year, and
- Approximately 1/3 of program funding in awards at a level of about $1M/yr, and
- Approximately 1/2 of program funding in awards at a level of about $150K/yr.

If funding is near or at the high end of this range, NSF anticipates distributing, subject to the availability of funds,

- Approximately 30% of program funding in awards at levels of about $2M-$4M per year, and
- Approximately 40% of program funding in awards at levels of about $1M/year, and
- Approximately 30% of program funding in awards at levels of about $150K/year.

Anticipated date of awards: **September 2000.**

Award numbers and sizes are contingent on availability of funds.

PROPOSAL PREPARATION & SUBMISSION SUMMARY

- **Proposal Preparation Instructions**

  - Letter of Intent requirements: **Required.** Letters of intent should be sent from the prospective PI by email to itr-loi@nsf.gov**,** and should contain the PI and co-PI's names, a list of possible participating institutions,

a possible title, and not more than 500 words to describe the work enough to permit intelligent choice of reviewers. Letters of intent will not be evaluated or used to decide on funding. They are requested to assist NSF in planning the review process. The submission of letters of intent enables NSF to begin choosing panelists before the proposal submission deadline.

- Pre-proposal requirements: **Required for proposals requesting over $500K total.**
- Proposal preparation instructions: **Standard NSF Grant Proposal Guide instructions**
- Preparation of proposal supplementary information: **Up to two additional pages are allowed to describe the details of any proposed international collaborations;** see instructions later in the solicitation under the heading "Proposal preparation instructions**".**

Deviations from standard (GPG) proposal preparation instructions: **FastLane required. In addition, the signed cover sheet must be scanned into the Supplementary Documents section of your FastLane proposal and submitted as part of the proposal. (Note: This requirement deviates from the Grant Proposal Guide, GPG I.F.1., regarding submission of signed proposal cover sheets.)**

♦ **Budgetary Information**

- Cost sharing/matching requirements: **None.**
- Indirect cost (F&A) limitations: **None.**
- Other budgetary limitations:

  Projects requesting more than $500K total must submit pre-proposals. No budget should exceed $3M per year or five years duration. Only proposals with budgets above $500K total may request more than three years duration.

♦ **FastLane Requirements**

- FastLane proposal preparation requirements: **FastLane use required.**

FastLane point of contact: **FastLane User Support at 703-306-1142,** or **fastlane@nsf.gov**.

DEADLINE/TARGET DATES

- **Budgets exceeding $500K total**:
- Letters of intent (Required): November 15, 1999 (email to **itr-loi@nsf.gov**)
- Pre-Proposal Deadline 5:00 PM PI's local time, January 5, 2000 (FastLane)
- Full Proposal Deadline 5:00 PM PI's local time, April 17, 2000 (FastLane)

- **Budgets NOT exceeding $500K total:**
- Letters of intent (Required): January 5, 2000 (email to **itr-loi@nsf.gov**)
- Full Proposal Deadline: 5:00 PM PI's local time, February 14, 2000 (FastLane)

PROPOSAL REVIEW INFORMATION

♦ Merit Review Criteria: **Standard National Science Board approved criteria.** Both criteria will be applied.

AWARD ADMINISTRATION INFORMATION

♦ Grant Award Conditions: **GC-1, CA-1 or FDP III**

- Special grant conditions anticipated: **Award conditions are dependent on the nature of the project.**

- Special reporting requirements anticipated: **Reporting requirements are dependent on the nature of the project.**

Introduction

The purpose of this program is to augment the knowledge base and the workforce needed to enhance the value of information technology for everyone. Information technology will be essential for solving critical national problems in areas such as fundamental science and engineering, the environment, health care, and government operations; but new fundamental understanding is required to make optimal progress. Thus, proposals must approach research activities in innovative ways rather than suggesting routine applications of existing technology.

The breadth of activities covered under this solicitation is significant. To simplify the process, the program description highlights key categories for proposal submission. NSF encourages projects that integrate across these categories.

Specific instances of research in this text are examples of, and not limitations on, the content of proposals. NSF encourages researchers from all scientific disciplines to submit innovative research proposals on any aspect of information technology including applications areas requiring beyond current state-of-the-art computational methods and tools. NSF particularly encourages proposals that contribute to fundamental understanding of both information technology and other scientific disciplines, as well as proposals for collaboration with international researchers, for-profit corporations, and national laboratories.

Program Description

- **Software**

  NSF invites proposals for research to improve both our ability to write software and the quality of the software we write. Proposed research should increase the scientific basis of software engineering, provide a more reliable process for building software, and help us build highly reliable software systems. Proposals should focus on innovations, not elaborations of existing toolkits or systems.

  Improved technology for software creation, and software that is more reliable, more predictable, more robust, and more modifiable or adaptable are among the goals for this aspect of ITR research. Proposals should suggest ways to evaluate or validate the techniques suggested. Software metrics, secure software systems, and programming by end-users in particular discipline areas in high-level languages, are major emphases for FY2000. Proposals for work in software for a particular field of application must involve cooperation of researchers in that area.

  Security of information systems, including privacy, is a critical national need. Developing methods for building high-confidence software systems that are resistant to failure and to attack, new technologies suitable for the design of very large scale systems involving both hardware and software, and methods for building scalable software systems that can be extended to large numbers of cooperating computers are particularly exciting areas for ITR projects.

- **Information Technology Education and Workforce**

  Educating our citizens to fill the estimated one million vacant positions in the information technology industry is a critical national need. Fundamental research projects in universities should contribute to educational needs by training students, developing new research foci in existing departments, and increasing the breadth and depth of IT research activities in U.S. universities.

  Research projects should develop new methods for educating people in IT or explore the use of learning technologies in educating K-16 students for IT careers. NSF also is interested in research on methods to increase IT literacy and skills among the general student and public populations. Projects which exploit international cooperation and comparisons in the understanding of workforce and educational issues are particularly encouraged.

- **Human-Computer Interface**

  Human-computer interface research proposals will address our understanding of human perceptual, cognitive and social abilities and their relation to interface design. Proposals should seek new ways of

improving our ability to use computers, or to extend the communities that use computers. Interfaces of particular benefit to scientific users, the elderly, the disabled, or schoolchildren are encouraged.

Examples of interface technologies include: visualization, graphical techniques, language processing, computer perception, robotics as related to personal interactions with computers, and new sensors and/or display methods. However, NSF urges proposers to consider developing new interface modes that may move human-computer interface to a higher level of use.

NSF has special interest in the possibility of assistive interfaces that cannot only extend human capabilities for those with limited sight, hearing or dexterity, but can also offer superior capabilities to all users. Community studies and collaborative use of computer systems and networks are also included in this category.

- **Information Management**

  Increasing the utility and scope of online information is the goal of this element of the ITR research program. Proposals should outline fundamental research activities dealing either with online content (transforming the kind, quality or amount of material online) or with access (increasing the utility of online information via research on quality, economics, searching, or other related areas).

  Proposals relating to online information content should involve a significant body of online information; they should address the nature of the material, what is new, and how it will be provided in a sustainable and permanent way. This includes managing data derived from sensors and imaging systems, new kinds, media, or genres of data, long-term digital archiving, data fusion across many kinds and sources of information, the modeling and assimilation of scientific data, new methods of assuring data quality, and research into principles of metadata.

  Data systems in scientific areas link NSF's ITR activity with research across other sciences and engineering. Eligible areas include the earth, atmospheric and ocean sciences; the biological sciences; the mathematical, physical, chemical and astronomical sciences; the engineering sciences; and the social and behavioral sciences. Proposals in specific areas should involve discipline experts in those areas as well as in computer science and information technology. Proposals on data quality, data modeling, and similar topics should involve experts in the statistical sciences where appropriate.

  Proposals relating to access should involve new ways of finding and using information or of providing information to new communities of users. Proposals may involve multi-lingual information systems, mobile information systems, new kinds of information organization and searching, new uses of multi-media, and the economics of information systems.

- **Advanced Computational Science**

  Proposals in this area should demonstrate a leading-edge research contribution to algorithms, software, and systems that is applicable to scientific and engineering computation. Larger requests must also contribute to advances in another scientific discipline. Such requests should involve collaborations of researchers in both computing and other disciplinary sciences.

  Research in advanced computational science combines algorithms, software, and systems, including topics such as numerical methods, optimization, symbolic and algebraic computation, computational geometry, software libraries, data handling, problem-solving environments, systems design, computer graphics and scientific visualization. When coupled with other disciplines, the proposed efforts must impact fundamental research in both areas, rather than applying previously known computational techniques to application areas.

  NSF expects advanced computational research coupled to other sciences to address areas such as: simulation of biological, physical, geological, or social phenomena, real-time collection and analysis of experimental data, new advances in instrumentation, validation of existing models, and proposal and validation of novel theories. The resulting advances must impact the core of the field of study. All the NSF Directorates have expressed interest in this aspect of the initiative.

  Plans for distributing software or other technology developed in the course of the research should be addressed in the proposal. NSF expects that others will be able to build upon the success of these projects.

Projects funded at levels above $500K should disseminate their results in easy-to-use form for the general scientific community.

- **Scalable Information Infrastructure**

  Fundamental aspects of networking, including network modeling, simulation, and emulation of very large networks; underlying network technologies such as optical and wireless networks; and middleware enabling large scale systems, information management, and information and service survivability form the core of research on scalable information infrastructure. Pervasive networking environments capable of networking very large numbers of potentially very small distributed and embedded devices effectively and efficiently, including network architecture, middleware, and human interface aspects, represent a broad area of interest. This includes highly scalable and adaptable network protocols for evolving application requirements, quality of service techniques including mechanisms for network control and scheduling, and network security and privacy tools.

  Research on scalable mobile information infrastructure should address the fundamental problem of wideband networking and wideband network access at any time and any place. Research goals may include multimegabit wireless access with seamless global roaming.

- **Social and Economic Implications of Information Technology**

  To maximize the benefits of new information technologies (IT) and infrastructures to the entire United States, research is needed to develop new knowledge about the underlying processes by which their development and use influence and transform society, and by which society simultaneously influences their development and use. Especially encouraged are proposals that suggest fundamental advances in our ability to a) understand the particular societal values embedded in design processes and products, b) model the co-evolution of IT and social groups, c) evolve new information technologies to better fill societal requirements, and d) sustain distributed and local use of critical infrastructures and networks over the long term.

  Advances in knowledge to overcome various social, economic, cultural and managerial barriers related to the use of IT and infrastructures are fundamental to maximizing societal benefits. These include, for example: IT access equity; universal participation in networks, infrastructures and digital economies; privacy issues related to new uses of digital information and archived communications; surveillance, monitoring, and tracking of network activities; the development of trust in distributed social settings and exchanges with strangers; intellectual property issues and rights related to electronic publishing, digital libraries, fair use in educational settings, etc.; and cross-cultural issues related to any of the above. NSF encourages international collaborations focused on these topics where appropriate.

  Specific areas of emphasis include: the economic and technical systems that comprise the digital economy, electronic markets, and Internet commerce, etc.; the causes and effects of unequal participation in IT by different social groups; the interdependence of technologies, institutions, and communities; and the evolution and functioning of IT-based collaboratories and distributed work environments. Also relevant are studies of how laws, ethics and social norms may be changing in relation to IT, of public access to government information, and of the involvement of IT in public decision-making.

  Development of new data and indicators that would facilitate tracking IT use and creation of new research methodologies to study the socio-economic implications of IT are also appropriate in this category.

- **Revolutionary Computing**

  Research into alternative technological substrates for computing looks beyond CMOS silicon to potential new technologies that do not share the physical limitations of CMOS and that offer additional possibilities for extensions either to smaller systems or to systems that compute in different ways. Potential topics include DNA molecules, quantum effects, and neuromorphic, optical and hybrid computing models.

  Proposals in revolutionary computing should describe the new technology, the plans for technological progress, and the ultimate limits of the technology as currently understood. The goal of the research should be a proof-of-concept demonstration of the power and applicability of the new technology.

As noted in the Introduction, specific instances of research in this text are examples of, and not limitations on, the content of proposals. NSF encourages researchers from all scientific disciplines to submit innovative research proposals on any aspect of information technology including applications areas requiring beyond current state-of-the-art computational methods and tools. NSF particularly encourages proposals that contribute to fundamental understanding of both information technology and other scientific disciplines, as well as proposals for collaboration with international researchers, for-profit corporations, and national laboratories.

ELIGIBILITY

Eligible institutions include U. S. universities and colleges and U. S. non-profit research institutions.

Collaboration with foreign researchers, for-profit corporations, and national laboratories (e.g. Federal agencies and Federally Funded Research and Development Centers (FFRDCs)) is encouraged but those organizations must provide their own funding.

Proposals are particularly encouraged from minority-serving institutions, undergraduate institutions, and institutions in EPSCOR states, either alone or as members of multi-institutional groups.

Mutually beneficial international collaborations are encouraged, which may provide access to complementary research facilities, support comparative international studies, or draw on individual abilities and knowledge in all countries. Applicants proposing international collaborations are encouraged to discuss their plans with the contact person for International Programs named in the list of cognizant program officers.

- PI eligibility limitations: **No individual may be Principal Investigator on more than two proposals or a PI or Co-PI on a total of more than four proposals.**
- Limitation on the number of proposals that may be submitted by an organization: None

AWARD INFORMATION

Under this solicitation, proposals may be submitted for any funding amount up to $3.0 million per year for up to five years. Any proposer requesting more than $500K total must submit a pre-proposal. Only proposals requesting more than $500K total may request a duration of more than three years. Grants may be awarded in a wide variety of sizes and durations; the majority of the funds available will be given in awards of not more than $1M per year. Awards above this threshold require a compelling justification. This justification should explain why a large project is the best way to perform the research, whether required by the breadth of the proposed activities, the interdisciplinary nature of the activities, or other reasons. Cooperative agreements may be used as the funding mechanism for large projects. The number of awards made will depend on the quality of submissions and the availability of funds. Anticipated date of awards: September 2000.

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

A. Letters of intent (Required)

Letters of intent should be sent from the prospective PI by email to itr-loi@nsf.gov**,** and should contain the PI and co-PI's names, a list of possible participating institutions, a possible title, and not more than 500 words to describe the work enough to permit intelligent choice of reviewers. Letters of intent will not be evaluated or used to decide on funding. They are requested to assist NSF in planning the review process. The submission of letters of intent enables NSF to begin choosing panelists before the proposal submission deadline.

B. Pre-Proposal Preparation Instructions

Pre-proposals are required for proposals requesting more than $500K and must be submitted via FastLane.
Preproposals should include:

- **Cover page.** (NSF Form 1207; only page 1, page 2 not required)

- **Information about the Principal Investigator (Form 1225) is automatically generated by FastLane.**
- **Project summary**. Provide a brief description of the project, identifying the scientific research problems to be addressed, the methodologies to be used, and the potential outcomes.
- **Project Description, Goals and Objectives** (maximum five pages): Discuss the goals, objectives and anticipated impact of the proposed project. Make clear that the proposed project is a research project, and that it contributes to advances in information technology and related sciences as appropriate.
- **Budget Outline**. Prepare a one-page cumulative budget for the full duration of the project. The budget need not be detailed but should be sufficient for reviewers to grasp the intended scale of the proposed project. (In FastLane, enter your cumulative budget in Budget Year 1. FastLane will automatically fill out a cumulative budget for your proposal.)
- **Biographical Sketches**. For all senior personnel (see Appendix C of the Grant Proposal Guide for a definition of senior personnel) provide a brief curriculum vitae including only name, current address, educational background, and up to 5 publications most closely related to the research. This section must not exceed two pages per person.

C. Proposal Preparation Instructions.

Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG), NSF 00-2, and Fastlane is required. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site at: <http://www.nsf.gov/>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone 301.947.2722 or by e-mail from pubs@nsf.gov.

Proposers are reminded to identify the program solicitation number (NSF 99-167) in the program announcement/solicitation block on the NSF Form 1207, "*Cover Sheet for Proposal to the National Science Foundation*." Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

Proposers requesting more than $500K total must submit a pre-proposal by January 5, 2000. Pre-proposal feedback will be provided by February 15, 2000. Final proposals are due by April 17, 2000. Pre-proposal feedback will either encourage or discourage submission of a full proposal. Relatively few awards of more than $1M per year will be encouraged.

Pre-proposal feedback is advisory; PIs may submit a final proposal even if discouraged by pre-proposal feedback, but no final proposal above $500K total budget or 3 year duration will be accepted which does not have an associated pre-proposal, and no more than one such final proposal may be submitted for each pre-proposal.

Proposals for under $500K and not more than three years need not have pre-proposals, and should be submitted by February 14, 2000.

Up to two additional pages are allowed to describe the details of any proposed international collaborations. This section should be clearly labeled "International Special Information" and should be included in Section I – Supplementary Documentation in Fastlane; it will not be included in the project description page count. It should include the names of major foreign collaborators, the objective of the collaboration, and the added benefit it would bring to the research project. A plan of visits to other countries and identification of who will travel should be included in the budget justification section.

D. Budgetary Information

Any proposal for more than $500K in total budget or more than 3 years duration must reference a pre-proposal on the NSF cover sheet (NSF Form 1207). (This is done in Fastlane by using the designated box on the NSF cover sheet) . Other budgetary requirements are in accordance with the Grant Proposal Guide. Cost-sharing is not required for proposals responding to this solicitation.

E. Proposal Due Dates.

For proposals with budgets exceeding $500K, letters of intent are requested by November 15, 1999. These are required but are not considered in the decision process; they are to assist scheduling the review process. The letters of intent will increase the quality of the match between the proposal and the reviewers.

Pre-proposals *must* be submitted by 5:00 p.m., PI's local time, January 5, 2000.

Full proposals *must* be submitted by 5:00 p.m., PI's local time, April 17, 2000. (Note: The signed cover sheet must be scanned into the Supplementary Documents section of your FastLane proposal and submitted as part of the proposal. **Hard copies should not be sent to NSF.)**

For proposals with budgets NOT exceeding $500K, letters of intent are requested by January 5, 2000. These are required and are not considered in the decision process; they are to assist scheduling the review process. The letters of intent will increase the quality of the match between the proposal and the reviewers.

Full proposals *must* be submitted by 5:00 p.m., PI's local time, February 14, 2000.

Submission of Signed Cover Sheets. Proposals must be submitted electronically via FastLane, and **you should print the certification page (page 2 of the cover sheet), obtain the necessary signatures, and scan the signed certification page into the Supplementary Documents section of your FastLane proposal for electronic submission as part of your proposal.** (Note: This requirement deviates from the Grant Proposal Guide, GPG I.F.1., regarding submission of signed proposal cover sheets.)

F. FastLane Requirements.

Proposers are required to prepare and submit proposals using the NSF FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at https://www.fastlane.nsf.gov/a1/newstan.htm.

Submission of Signed Cover Sheets. The signed cover sheet must be scanned into the Supplementary Documents section of your FastLane proposal and submitted as part of the proposal. (Note: This requirement deviates from the Grant Proposal Guide, GPG I.F.1., regarding submission of signed proposal cover sheets.)

PROPOSAL REVIEW INFORMATION

A. Merit Review Criteria.

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority serving institutions, adjacent disciplines to that principally addressed in the proposal.

Proposals will be reviewed against the following general merit review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

PIs should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give these factors careful consideration in making funding decisions.

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learner perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens — women and men, underrepresented minorities, and persons with disabilities — are essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three persons outside NSF who are experts in the particular fields represented by the proposal. Proposals submitted in response to this solicitation will be reviewed by panel review only. Pre-proposals will also be reviewed by panels only.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. A program officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation. In most cases, proposers will be contacted by the program officer after his or her recommendation to award or decline funding has been approved by his or her supervisor, the division director. This informal notification is not a guarantee of an eventual award. NSF will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. The interval ends when the division director accepts the program officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only an NSF Grants Officer

may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with an NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants Officer does so at its own risk.

AWARD ADMINISTRATION INFORMATION

A. Notification of the Award.

Notification of the award is made ***to the submitting organization*** by a Grants Officer in the Division of Grants and Agreements (DGA). Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator.

B. Grant Award Conditions.

An NSF grant consists of: (1) the award letter, which includes any special provisions applicable to the grant and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable grant conditions, such as Grant General Conditions (NSF GC-1)* or Federal Demonstration Partnership Phase III (FDP) Terms and Conditions* and (5) any NSF brochure, program guide, solicitation or other NSF issuance that may be incorporated by reference in the award letter. Electronic mail notification is the preferred way to transmit NSF grants to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1).

***** These documents may be accessed electronically on NSF's Web site at: <http://www.nsf.gov/>. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone 301.947.2722 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, (NSF 95-26) available electronically on the NSF Web site. The GPM also is available in paper copy by subscription from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The GPM may be ordered through the GPO Web site at: <http://www.gpo.gov>. The telephone number at GPO for subscription information is 202.512.1800.

C. Reporting Requirements.

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after expiration of a grant, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented a new electronic project reporting system, available through FastLane, which permits electronic submission and updating of project reports, including information on: project participants (individual and organizational); activities and findings; publications; and, other specific products and contributions. Reports will continue to be required annually and after the expiration of the grant, but PIs will not need to re-enter information previously provided, either with the proposal or in earlier updates using the electronic system.

Effective October 1, 1999, PIs are required to use the new reporting format for annual and final project reports.

D. New Awardee Information.

If the submitting organization has never received an NSF award, it is recommended that the organization's appropriate administrative officials become familiar with the policies and procedures in the NSF *Grant Policy Manual* which are applicable to most NSF awards. The "Prospective New Awardee Guide" (NSF 97-100) includes information on: Administration and Management Information; Accounting System Requirements and Auditing Information; and Payments to Organizations with Awards. This information will assist an organization in preparing documents that NSF requires to conduct administrative and financial reviews of an organization. The guide also serves as a means of highlighting the accountability requirements associated with Federal awards. This document is available electronically on NSF's Web site at: <http://www.nsf.gov/cgi-bin/getpub?nsf97100>.

CONTACTS FOR ADDITIONAL INFORMATION

General inquiries should be made to the ITR: Information Technology Program, first by consulting the FAQ at http://www.itr.nsf.gov, or by email to itr-prog@nsf.gov; or to one of the cognizant program officers listed in the Summary of Program Requirements. For questions related to use of FastLane, contact FastLane User Support at 703-306-1142, or fastlane@nsf.gov.

OTHER PROGRAMS OF INTEREST

The NSF guide to programs is a compilation of funding for research and education in science, mathematics, and engineering. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter. Many NSF programs offer announcements concerning specific proposal requirements. to obtain additional information about these requirements, contact the appropriate NSF program offices listed in Appendix A of the GPG. Any changes in NSF's fiscal year programs occurring after press time for the Guide to Programs will be announced in the NSF Bulletin, available monthly (except July and August), and in individual program announcements. The Bulletin is available electronically via the NSF Web Site at: http://www.nsf.gov. The direct URL for recent issues of the Bulletin is `http://www.nsf.gov/od/lpa/news/publicat/bulletin/bulletin.htm` Subscribers can also sign up for NSF's Custom News Service to find out what funding opportunities are available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities, and persons with disabilities to compete fully in its programs. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at (703) 306-1636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at (703) 306-0090 or through FIRS on 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne H. Plimpton, Reports Clearance Officer; Division of Administrative Services; National Science Foundation; Arlington, VA 22230.

YEAR 2000 REMINDER

In accordance with Important Notice No. 120 dated June 27, 1997, Subject: Year 2000 Computer Problem, NSF awardees are reminded of their responsibility to take appropriate actions to ensure that the NSF activity being

supported is not adversely affected by the Year 2000 problem. Potentially affected items include: computer systems, databases, and equipment. The National Science Foundation should be notified if an awardee concludes that the Year 2000 will have a significant impact on its ability to carry out an NSF funded activity. Information concerning Year 2000 activities can be found on the NSF web site at http://www.nsf.gov/oirm/y2k/start.htm .

Catalogue of Federal Domestic Assistance (CFDA) No.: 47.074 (BIO), 47.070 (CISE), 47.076 (EHR), 47.041 (ENG), 47.050 (GEO), 47.049 (MPS), 47.075 (SBE), 47.078 (OPP).

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